PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Philip L. Cole	Group Art Unit: 3663
Serial No.: 10/694,624	Examiner: Dudnikov, Vadim
Filed: October 27, 2003	Atty. Dkt. No.: COPL:002US
For: REMOTE SENSING DEVICE TO DETECT MATERIALS OF VARYING ATOMIC NUMBERS	

DECLARATION OF DR. PHILIP L. COLE UNDER 37 C.F.R. §1.132

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

I, Philip L. Cole, do hereby declare that:

1. I am an Associate Professor of Physics in the Department of Physics at Idaho State University and am a Research Associate at the Idaho Accelerator Center in Pocatello, Idaho. I have over twenty years of research experience in the area of nuclear and particle physics. I am the inventor and the applicant associated with U.S. Patent Application serial number 10/694,624, filed on October 27, 2003 ("application"). I have a financial stake in the application and any resulting patent.

2. I have reviewed the Office Action dated April 16, 2008. According to my understanding, the Office Action rejects Claims 1-3, 6, 7, 9, and 28-33 under 35 U.S.C. § 103(a) based

on the combination of U.S. Patent No. 5,524,133 to Neale ("Neale") in view of Günther et al., *Applicability of a Simple Parallel Plate Avalanche Detector to Photofission Experiments*, Nucl. Instrum. Methods, 163, 459-461 (1979) ("Günther"), and in view of Groom, *Photon and Electron Interaction with Matter*, LBNL, 152-53 (1998) ("Groom"). I disagree with the rejection of the claims based on the cited combination.

3. I have reviewed the Neale reference, and according to my understanding, Neale teaches using Zinc Tungstate or Cadmium Tungstate crystal detectors to detect an X-ray beam generated by a linear accelerator. (*Neale*, column 10, lines 24-65). Neale teaches detecting photons in the energy ranges of 10 keV-200 keV and 1 MeV-10 MeV. (*Neale*, Figs. 1-3; column 9 lines 40-45; column 10, lines 25-40). I do not believe that Neale teaches or suggests a method or system for "detecting an emerging photon beam within an energy range from about 1 MeV to about 50 MeV with an array of fission-fragment detectors, a first set of scintillator paddles, and a second set of scintillator paddles, wherein the array of fission-fragment detectors, the first set of scintillator paddles, and the second set of scintillator paddles (a) are arranged sequentially in a direct path of the emerging photon beam such that each receives the emerging photon beam, and (b) are sensitive to different ranges of photon beam energy," as described in claim 1.

4. The crystal detector taught by Neale is not capable of sustaining high photon fluxes of 10^7 photons per second (10 MHz). These crystals have a relatively long decay time of about 24 microseconds for Zinc Tungstate and 13 microseconds for Cadmium Tungstate, as compared with the 1 to 3 nanoseconds for organic plastic scintillators paddles. More specifically, these crystals cannot detect photon energies at the rates necessary to detect a

direct pulsed photon beam from a standard electron accelerator at the energy levels of between 1 MeV and 50 MeV. Therefore, the crystal detectors of Neale are not structural or functional equivalents of the array of fission fragment detectors, the first scintillator paddles and the second scintillator paddles of claim 1.

5. The crystals taught by Neale cannot be placed directly in the path of the emerging photon beam and hence could not be used in the method described in claim 1, because the Cadmium Tungstate and Zinc Tungstate crystals in Neale cannot sustain high photon rates above 100 kHz (10^5 photons per second).

6. Presently, according to my understanding, the size of these crystals taught by Neale cannot be manufactured beyond about 10 cm in diameter. They are therefore limited in size as compared to the scintillator paddles and the fission fragment detectors of claim 1.

7. The maximum energy of the bremsstrahlung photons is generally predicated upon the energy of the electron beam. Since Neale uses a maximum of 10 MeV electrons from an accelerator, the photon energy in the system taught by Neale could not exceed 10 MeV. (*Neale*, Figs. 1 and 3; column 10, lines 23-30). Therefore, Neale does not teach or suggest a system or method that is capable of "detecting an emerging photon beam within an energy range from about 1 MeV to about 50 MeV" as described in claim 1, because the system taught by Neale is not capable of generating photon energies up to 50 MeV.

8. Neale requires two or more accelerators operating at two separate electron endpoint energies neither of which will operate above 10 MeV. These two accelerators operate at different energies, each below 10 MeV, to determine the relative ratio of the yield of

photons. The relative ratio, Na/Nb relating to the yield from accelerator a to that from accelerator b, is used to determine the mean atomic number of the probed material. Accordingly, the configuration taught by Neale cannot probe for elements beyond Z = 14 or silicon (*see Neale*, FIG. 2). Therefore, Neale does not teach or suggest a method for detecting fissile material as described in claim 1, because the system taught by Neale is not capable of detecting fissile material such as uranium or plutonium or even capable of detecting lead shielding.

9. Since Neale uses two or more accelerators, and crystal detectors which are only capable of detecting photon energies of 10 MeV and below, it would not have been predictable that an array of fission-fragment detectors, a first set of scintillator paddles, and a second set of scintillator paddles could be used to detect an emerging photon beam generated by a single accelerator within the energy range from about 1 MeV to about 50 MeV as described in claim 1. Furthermore, this type of modification would have made the system of Neale unsatisfactory for its intended purpose of determining a relative ratio, Na/Nb relating to the yield from accelerator a to that from accelerator b, to determine the mean atomic number of a probed material.

10. I hereby declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

July 11, 2008
Date

Philip L. Cole, Ph.D.